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IS 15453 (2004): Spring - Torsion Bar Springs [TED 21: Spring]

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“Knowledge is such a treasure which cannot be stolen”

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भारतीय मानक

स्प्रिंग — मरोड सरिया स्प्रिंग — विशिष्टि

Indian Standard

SPRING — TORSION BAR SPRINGS — SPECIFICATION

ICS 21.160; 43.040.50

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

August 2004

Price Group 2

Automotive Springs and Suspension Sectional Committee, TED 21

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Automotive Springs and Suspension Sectional Committee had been approved by the Transport Engineering Division Council.

This standard is based on JIS B 2705 'Torsion Bar Springs' published by Japanese Standards Association.

The object of this standard is to help the designers and manufacturers of automobiles and spring industries in India.

This standard covers details of materials, dimensions and test methods of springs. They are used in pulsation for the suspension system of automobile vehicles.

The composition of the Committee responsible for the formulation of this standard is given at Annex A.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

SPRING — TORSION BAR SPRINGS — SPECIFICATION

1 SCOPE

This standard specifies torsion bar springs with a circular cross-section, referred as the bars, and used in pulsation for the suspension system of automobiles, railway vehicles, etc.

2 REFERENCES

The following standards contain provisions which through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below:

IS No.	*Title*
1500 : 1983	Method for Brinell hardness test for metallic materials (*second revision*)
3431 : 1982	Steel for the manufacture of volute, helical and laminated springs for automotive suspension (*second revision*)
3703 : 1980	Code of practice for magnetic particle flaw detection (*first revision*)
6396 : 2000	Methods of measuring decarburized depth of steel (*second revision*)
8051 : 1976	Steel ingots and billets for the production of volute, helical and laminated springs for automotive suspension

3 SYMBOLS

Following symbols and terminology shall apply (*see* Fig. 1).

3.1 Bar Length, L in mm.

3.2 Bar Diameter, d in mm.

3.3 Grip Section, part C in mm.

3.4 Taper Section, part B in mm.

3.5 Parallel Section, part A in mm.

3.6 Maximum Torque, The maximum torque to be anticipated in use.

3.7 Reference, Torque equivalent to 10 percent of the maximum torque.

4 SPRING CHARACTERISTICS

4.1 Specification of Spring Characteristics

4.1.1 The spring characteristics of bars shall be specified in terms of the spring constant, which shall be calculated from the following formula:

$$K = \frac{T_2 - T_1}{\theta_2 - \theta_1}$$

where

K = spring constant [in N.mm/rad (kgf.mm/rad)],

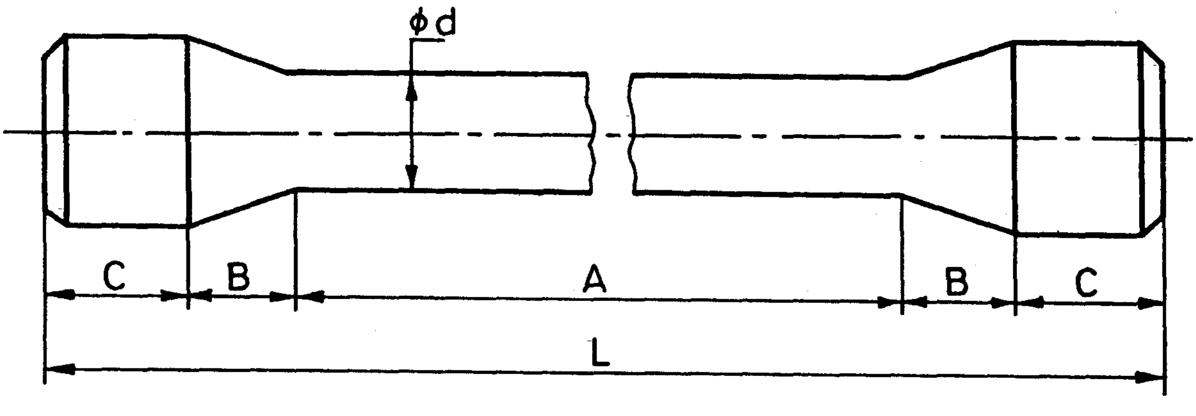

FIG. 1 BARS

T_2 = torque equivalent to 70 percent of the maximum torque [in N.mm (kgf.mm)],
T_1 = reference torque [in N.mm (kgf.mm)],
θ_2 = torsion angle at T_2 (in degrees), and
θ_1 = torsion angle at T_1 (in degrees).

4.2 Tolerance on Spring Constant

Tolerance on the spring constant shall be ±3 percent.

5 HARDNESS

The hardness of bars after tempering shall be 415 to 495 HB in Brinell hardness.

6 SHAPE AND DIMENSIONS

6.1 Shape and dimensions of grip section shall be as follows.

6.1.1 When the cross-sectional shape of the grip section is orthohexagonal, the dimensions shall be as given in Table 1. The tolerance on the width across flats (*S*) shall be from 0 to –0.5 mm.

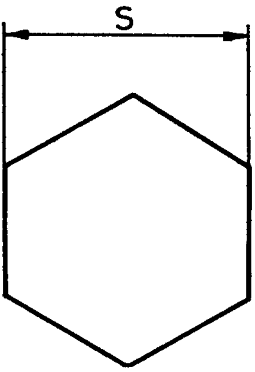

FIG. 2 FLATS

Table 1 Dimensions of Grip Section

All dimensions in millimetres.

Basic Dimensions of Width Accross Flats, (S)	20, 22, 24, 26, 28, 30, 33, 36, 39, 42, 46 & 50

6.1.2 When the grip section has a serrated form, the dimensions shall be as given in Table 2.

6.1.3 The tolerance of major diameter of the grip section shall be from 0 to – 0.2 mm.

6.2 Dimensions and Tolerances for Bars

The dimensions of bars shall be decided by specification. However, the tolerance on the bar length (*L*) and the tolerance on the bar straightness shall be as given in Table 3.

6.2.1 The accuracy of the grip section other than those mentioned above shall be as agreed to between the manufacturer and the purchaser.

Table 2 Dimensions of the Serrated form of Grip Section

(*Clause* 6.1.2)

Sl No. (1)	Module (2)	Pressure Angle Degree (3)	Number of Teeth (4)	Major Diameter of Grip Section mm (5)
i)	0.75	45	25	19.50
ii)	0.75	45	28	21.75
iii)	0.75	45	31	24.00
iv)	0.75	45	34	26.25
v)	0.75	45	37	28.50
vi)	0.75	45	40	30.75
vii)	0.75	45	43	33.00
viii)	0.75	45	46	35.25
ix)	0.75	45	49	37.50
x)	1.00	45	38	39.00
xi)	1.00	45	40	41.00
xii)	1.00	45	43	44.00
xiii)	1.00	45	46	47.00
xiv)	1.00	45	49	50.00

Table 3 Dimensions and Tolerances for Bars

(*Clause* 6.2)

Tolerance on Bar Length (L) (1)	± 0.15 % (Minimum Value ±1.5 mm) (2)	
Tolerance on bar straightness	For bar length under 1 000 mm	1.5 mm, *Max*
	For bar length 1 000 mm or over to 1 500 mm	2.0 mm, *Max*
	For bar length 1 500 mm or over	2.5 mm, *Max*

7 APPEARANCE

The surface of bars shall be free from detrimental defects such as surface roughening, flaws, and decarburization.

8 MATERIAL

The materials should be suitable spring steel (*see* IS 3431 and IS 8051).

9 MANUFACTURING METHOD

The manufacturing method of bars shall be as follows:

a) Before heat treatment, bars shall be subjected to working in the grip section and the taper section and to cutting or grinding in the parallel section.

b) The grip section of bars shall be either left as upset or subjected to serration. The taper section shall be either left as upset or finished by cutting.

c) Bars shall be uniformly quenched and tempered.

d) When shot peening is applied, the working conditions shall be as agreed to between the manufacturer and the supplier.

e) Bars shall be subjected to setting with the cutting direction clearly indicated. The residual strain caused by setting shall normally be within 1 percent.

10 PAINTING

Bar shall be given a coating of anti-rust painting. However, the method for anti-rust painting shall be as agreed to between the manufacturer and the purchaser

11 TEST METHOD

The test method for bars shall be as follows.

11.1 Spring Constant

The measurement of spring constant is carried out after once loading the maximum torque on bars.

11.2 Hardness

The hardness test is carried out on a test piece. A test piece having the same diameter as that of a bar and the length of not less than 4 times its diameter is simultaneously subjected to the same heat treatment as that for the product and tested in accordance with IS 1500.

11.3 Shape and Dimensions

The tests for shape and dimensions are carried out by direct measurement, limit gauges and other suitable method.

11.3.1 For bar straightness, when centre holes are at both ends of the bar, they are supported there and when no centre hole, both ends of the parallel section are put on V blocks. The bar is rotated as it is, the deflection amount is measured at the centre section of the bar and one half of it is taken as the measured value.

11.4 Appearance

The appearance of a bar is tested by visual inspection or when required as per IS 3703 and IS 6396 respectively.

12 INSPECTION

Bars shall be inspected as follows. However, the sampling inspection plan in the case of lot production shall be as agreed to between the manufacturer and the supplier.

a) *Spring Characteristics* — shall conform to the requirements specified in **4**, when tested by **11.1**.

b) *Hardness* — shall conform to the requirements specified in **5**, when the test given at **11.2** is carried out on one piece for each lot of heat treatment in accordance with IS 1500.

c) *Shape and Dimensions* — shall conform to the requirements specified in **6**, when tested as given at **11.3**.

d) *Appearance* — shall conform to the requirements specified in **7**, when tested as given at **11.4**.

13 MARKING

13.1 Bars shall be marked with the following information:

a) Manufacturer's name or trade-mark;
b) Direction of setting;
c) Lot No., batch No.; and
d) Month and year of manufacture.

13.2 BIS Certification Marking

The use of standard mark is governed by the provisions of the *Bureau of Indian Standards Act*, 1986 and the Rules and Regulations made thereunder. The details of conditions under which the licence for use of Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

ANNEX A

(*Foreword*)

COMMITTEE COMPOSITION

Automotive Springs and Suspension Sectional Committee, TED 21

Organization	*Representative(s)*
Tata Motors Ltd, Jamshedpur	Shri A. G. Pradhan (***Chairman***) Shri K. Gopalakrishna (*Alternate*)
Akal Springs Pvt Ltd, Ludhiana	General Manager
All India Springs Manufacurers Association, Mumbai	Shri A. A. Mirchandani
Ashok Leyland Ltd, Chennai	Shri Appalaraju Shri U. Jaikrishna (*Alternate*)
Association of State Road Transport Undertakings, New Delhi	Shri A. S. Lakra Shri P. M. Phate (*Alternate*)
Central Institute of Road Transport, Pune	Shri N. R. Kachare Shri P. S. Munoli (*Alternate*)
Central Mechanical Engineering Research Institute, Durgapur	Dr J. Basu Dr T. K. Paul (*Alternate*)
Conventry Springs & Engineering Co Pvt Ltd, Kolkata	Shri A. Bafna Shri A. S. Kohli (*Alternate*)
CQA (OFV) Vehicle Factory, Jabal Pur	General Manager
Gabriel India Ltd, Mumbai	Shri K. Sundararaman Shri S. K. Bhaumick (*Alternate*)
Jai Parabolic Springs Ltd, Chandigarh	Shri Sunil Haroliya
Jamna Auto Industries Ltd, Yamuna Nagar	Shri D. S. Gill Shri B. K. Khandelwal (*Alternate*)
Kemen Springs Pvt Ltd, Mumbai	Shri P. K. Mirchandani
Mack Springs Pvt Ltd, Thane	Shri D. V. Sharma
Mahindra & Mahindra Ltd, Nashik	Shri Ravindra Deshmukh Shri Kailash Jat (*Alternate*)
Maruti Udyog Ltd, Gurgaon	Shri D. N. Dave Shri G. Vijayan (*Alternate*)
Ministry of Heavy Industry & Public Enterprises, New Delhi	Shri S. K. Bharij Shri R. K. Tripathi (*Alternate*)
Research Designs & Standards Organization, Lucknow	Joint Director (Standards) Assistant Design Engineer (*Alternate*)
Stumpp, Schuele & Somappa Pvt Ltd, Bangalore	Shri B. S. Mookherjee Shri N. C. Srinivasan (*Alternate*)
The Automotive Research Association of India, Pune	Shri S. Raju
Upper India Steel Mfg & Engg Co Ltd, Ludhiana	Shri R. P. Engira
Vehicle Factory, Jabalpur	Shri M. K. Mishra Shri R. Lodwal (*Alternate*)
BIS Directorate General	Shri K. K. Vashistha, Director & Head (TED) [Representing Director General (*Ex-officio*)]

Member Secretary
Shri P. K. Sharma
Director (TED), BIS

Bureau of Indian Standards

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